Glossary: Optics

aberration: a distortion in an image produced by a lens

additive color: A primary light color—red, blue, or green; these three colors produce white light when added together.

angle of incidence: The angle between a wave striking a barrier and the line perpendicular to the surface.

angle of incidence: the angle, with respect to the normal, at which a ray meets a boundary between media or a reflective surface

angle of reflection: The angle between a reflected wave and the normal to the barrier from which it is reflected.

angle of reflection: the angle, with respect to the normal, at which a ray leaves a reflective surface

angle of refraction: the angle between the normal and the refracted ray

angstrom: An angstrom is 1/100,000,000 of a centimeter.

central axis: a line perpendicular to the center of a lens or mirror extending in both directions

chromatic aberration: an aberration related to color

concave lens: A lens that is thinner in the middle than at the edges; used to correct nearsightedness.

concave lens: a lens that causes light rays to diverge from the central axis

concave mirror: a mirror with a reflective side that is curved inward

converging lens: a convex lens

convex lens: A lens that is thicker in the middle than at the edges; used to correct farsightedness.

convex lens: a lens that causes light rays to converge toward the central axis

convex mirror: a mirror with a reflective side that is curved outward

critical angle: an incident angle that produces an angle of refraction of 90°

diffraction grating: A piece of transparent or reflecting material, which contains many thousands of parallel lines per centimeter; used to produce a light spectrum by diffraction.

dispersion: separation of white light into its component wavelengths

diverging lens: a concave lens

electromagnetic spectrum: Transverse radiant energy waves, ranging from low frequency to very high frequency, which can travel at the speed of light.

electromagnetic wave: A wave that does not have to travel through matter in order to transfer energy.

element: A substance that cannot be broken down into simpler substances by ordinary means.

equilateral triangle: A triangle with three equal angles of 60 degrees and sides of equal length.

filter: A screen that allows only certain colors to pass through it; a transparent material that separates colors of light.

focal length: The distance between the principal focus of a lens or mirror and its optical center.

focal length: the distance from the focal point to the mirror

focal point: the point at which rays converge or appear to converge

focal point/focus: The point that all light rays from a mirror or lens pass through.

frequency: The number of waves that pass a point in a given unit of time.

gamma ray: High-energy wave of high frequency and with a wavelength shorter than an x ray; released in a nuclear reaction.

image: The reproduction of an object formed with lenses or mirrors.

in phase: When two or more light rays overlap exactly at the crest and the trough, they are said to be "in phase."

incident ray: the incoming ray toward a medium boundary or a reflective surface

index of refraction: The amount that light is refracted when it enters a substance; given as the ratio of speed of light in a vacuum to its speed in a given substance.

index of refraction: the speed of light in a vacuum divided by the speed of light in a given material

infrared radiation: Invisible radiation with a longer wavelength than red light and next to red light in the electromagnetic spectrum; used in heat lamps, to detect heat loss from buildings, and to detect certain tumors.

interference: The addition by crossing wave patterns of a loss of energy in certain areas and reinforcement of energy in other areas.

kaleidoscope: A toy in which reflections from mirrors make patterns. It was invented in 1819 by David Brewster.

laser (light amplification by stimulated emission of radiation): A device that produces a highly concentrated, powerful beam of light which is all one frequency or color and travels only in one direction.

law of reflection: Angle of incidence equals the angle of reflection.

law of reflection: the law that indicates the angle of reflection equals the angle of incidence

law of refraction: the law that describes the relationship between refractive indices of materials on both sides of a boundary and the change in the path of light crossing the boundary, as given by the equation n1 sin $\omega 1 = n^2 sin\omega^2$

lens: A curved, transparent object; usually made of glass or clear plastic and used to direct light.

light: Light is a form of energy, traveling through the universe in waves. The wavelengths of visible light range from less than 4,000 angstroms to more than 7,000 angstroms.

normal: A line perpendicular to a surface.

opaque: Not transparent; no light passes through the material.

optical axis: The line straight out from the center of a parabolic mirror; straight line through the center of a lens.

optical fiber: A thin strand of glass that transmits light down its length.

optical telescope: A tube with magnifying lenses or mirrors that collect, transmit, and focus light.

out of phase: When the crest of one wave overlaps the trough of another they are said to be "out of phase."

parabola: A curved line representing the path of a projectile; the shape of the surface of a parabolic mirror.

parabolic mirror: A curved mirror with a single focal point..

pigment: A material that absorbs certain colors of light and reflects other colors.

plane mirror: A mirror with a flat surface.

polarized light: Light in which all waves are vibrating in a single plane.

prism: A transparent material with two or more straight faces at an angle to each other.

ray: light traveling in a straight line

real image: An image that can be projected onto a screen; formed by a parabolic mirror or convex lens.

real image: an optical image formed when light rays converge and pass through the image, producing an image that can be projected onto a screen

reflecting telescope: A telescope in which magnification is produced by a parabolic mirror.

reflection: The light or image you see when light bounces off a surface; bouncing a wave or ray off a surface.

refracted ray: the light ray after it has been refracted

refraction: Bending of a wave or light ray caused by a change in speed as it passes at an angle from one substance into another.

scattering: The spreading out of light by intersecting objects, whose size is near the wavelength.

Snell's law: the law of refraction expressed

mathematically as $\theta_1 \sin \theta_1 = \theta_2 \sin \theta_2$

spherical: Surface of a lens or mirror that is part of a sphere.

subtractive color: One of the three pure pigment colors—magenta, yellow, cyan; these pigment colors produce black when mixed.

total internal reflection: reflection of light traveling through a medium with a large refractive index at a boundary of a medium with a low refractive index under conditions such that refraction cannot occur

translucent: Semitransparent; a material that admits some light.

transparent: See-through; light can go through.

true image: A true image is the way other people see us. It is the opposite of the image that is seen in a mirror.

ultraviolet radiation: Radiation that has a shorter wavelength than visible light; next to violet light in the electromagnetic spectrum.

virtual image: An image formed by a mirror or lens that cannot be projected onto a surface.

virtual image: the point from which light rays appear to diverge without actually doing so

visible light spectrum: Band of visible colors produced by a prism when white light is passed through it.

wavelength: The total linear length of one wave crest and trough.

X-ray: Invisible electromagnetic radiation of great penetrating power.